

Providing Analysis Support in the Early Stages of Military Concept Development

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ABSTRACT

Operations analysis support to military concept development is frequently addressed in the context of experimentation (discovery experiments, hypothesis testing experiments). Concept developers will most certainly require analysis support before they are ready to enter the experimentation phase. This paper will discuss how the operations analyst can support the concept developer early in the concept development process. Topics include conducting basic research, applying the scientific method to the concept being examined (define the objective, identify alternatives, develop the context, examine assumptions, develop metrics), developing a concept development project plan, and ensuring analytically rigorous processes are applied to the topic at hand.

1.0 INTRODUCTION

Operations analysis support to military concept development efforts is frequently addressed in the context of experimentation analysis and modelling and simulation support. Operations analysts are sometimes not engaged until the concept development effort is well underway. The operations analysis community can provide essential support to the military concept development effort throughout the process, and can provide invaluable assistance early in the process. For the purposes of this discussion, “early in the process” is defined as those activities prior to releasing the first draft of the concept for external review and before the first formal experiment. The first section of this paper reviews the need for analysis support early in the concept development process. The second section details the development of the analysis support plan and assisting in developing the overall concept development program management plan. The third section discusses potential roles for the operations analyst in the area of research support. The final section provides a methodology for providing analysis support early in the concept development effort.

2.0 THE NEED FOR ANALYSIS

Operations research is rooted in the scientific method and can serve as a scrupulously logical, analytically rigorous foundation for any military concept development effort. Operations research provides a transparent, traceable methodology that is well suited for review throughout the concept development effort. It also provides a structure that balances the need for innovation and creativity with analytic rigor and accountability. Concept development efforts may be driven by military staff planning processes. This approach can be improved by involving analysts early in the concept development process.

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2.1 Deficiencies in the “Traditional Staff Planning Process” Approach to Concept Development

Concept development activities may follow the traditional staff planning model. A representative sequence of activity follows:

- Staff officer assigned responsibility for concept development activity, conducts basic research, and develops first draft and submits to chain of command for review. There may be a tight timeline associated with the effort.
- Sequential review and editing by branch head, section chief, and division director.
- Revised draft distributed to appropriate commands for review and comment.
- Experimentation program commences.

There are a few problems with this approach. First, the model relies on the creativity and imagination of a single (often overworked) staff officer who may not have a broad background in concept development. This staff officer may not have many resources at his disposal to conduct a basic research program. There is usually not an opportunity to solicit creative inputs from within the command and from outside commands prior to developing the first draft of the concept. Additionally, the lengthy staffing process may cause excessive delay in making the first draft available for external review. Finally, there is little or no analytic rigor associated with this process.

2.2 Early Involvement of the Analysis Staff

The concept development process may be improved by engaging the analysis staff early in the development process. Ideally, an analyst will be one of the initial members assigned to the concept development core team. The rest of this paper examines how the analyst can support the concept development process.

3.0 DEVELOPING THE PROJECT ROAD MAP AND ANALYSIS SUPPORT PLAN

A well structured concept development program will be supported by a detailed program management plan or program “road map”. There are two areas where the analyst can add value. The first task is to assist the program manager in developing the overall “road map”. The analyst will help ensure that analytic rigor is “built in” to the project plan from the beginning, and can provide valuable advice on how to devise an appropriate concept development and experimentation program. The second task is to develop an “analysis support plan”. The analysis support plan explicitly identifies the analytic activities and resources that are required to support the program road map. This approach will aid the overall concept development effort by providing the appropriate structure and outlining the necessary analytic activities.

4.0 RESEARCH SUPPORT

One of the initial steps in the concept development effort is to conduct basic research to gain a better understanding of the fundamental issues. If you are in an academic environment or a research-oriented command there is typically a rich pool of personnel with advanced research skills. If you are located at a headquarters staff or an operational command, however, there may be a shortage of people with advanced or even basic research skills. The concept development team analyst may be a valuable source of data collection and basic research support and is a good candidate to head up the research effort.

5.0 ANALYSIS SUPPORT METHODOLOGY

This section provides a methodology for analysis support early in the concept development process. Four discrete steps are discussed. The first step is to help the concept development team define the problem to be addressed by the concept. The second step is to consider a broad range of alternatives. The third step is determining what factors and issues are important. The final step is informal, seminar-style war gaming to examine how various elements of the concept interact. Each of these steps will be discussed in detail.

5.1 Defining the Question

What fundamental problem or issue is the concept development team addressing? The first step in the scientific method is defining the question. “It often occurs that the major contribution of the operations research worker is to decide what is the real problem.”¹ The operations analyst is trained in carefully considering the problem at hand. The analyst can assist the concept development team by reviewing the research materials and leading the effort to formulate the initial problem statement. This should be a collaborative effort and involve all key members of the concept development team. It is essential to confer with the decision maker to ensure that the team is pursuing the correct problem. The team analyst should take this opportunity to introduce the concept development team to all aspects of formulating the problem. These steps include identifying alternatives, developing the operational context, examining assumptions, and developing metrics. All of these issues should be thoroughly examined prior to releasing the draft concept for external review. The follow-on stages in this methodology address each of these steps.

5.2 Harvesting Ideas

In order to fully understand the problem at hand it is essential to consider a broad range of alternatives. It is useful to solicit inputs from all organizations that have a stake in the concept your team is developing. It is even better if you do this in a structured, analytical way.

A formally facilitated, small workshop format works well for collecting thoughts and observations. It is essential to recruit participants that have significant operational experience in the topic of interest. This brings credibility to the workshop. Be careful to ensure that a broad range of organizations and viewpoints are represented. It is helpful to have the workshop participants seated at a computer workstation connected to a common network so they can share their ideas electronically as well as verbally. There are several software products designed with this specific application in mind. Process modelling software can visualization tools are also useful in aiding helping the participants better understand the fundamental issues that need to be addressed by the concept.

An analyst should be assigned to each of the workshops. The analyst should not serve as the workshop facilitator. Analysis and facilitation are different functions with different skill sets. The analyst’s job is to listen, observe, and identify the key points. Before the workshop ends the analyst should work closely with the facilitator and conduct a “hot wash-up session”. The analyst then conducts a thorough analysis of the workshop proceedings and produces a formal report for use by the concept development team.

What are the benefits of this “harvesting ideas” process? First, it helps the concept development team develop a better understanding of the problem at hand by considering a broad range of alternatives. Second, it expands the participant base in the concept development process. There may be a number of sceptics and critics in a

¹ Morse and Kimball, *Methods of Operations Research*, p. 5.

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concept development effort. This small workshop approach provides an opportunity to turn potential critics into concept development partners by involving concerned commands early in the process.

5.3 Determining What is Important

After inputs have been “harvested” they need to be processed to determine “what is important”. There may not be much quantitative information available at this stage in the concept development process, and the analysis team may need to rely on qualitative methods and “expert judgment” techniques to prioritize the inputs. There are a number of decision analysis methods available to provide rigor and credibility to the process. These approaches include Value Focused Thinking, Analytic Hierarchy Process, Decision By Objectives, and Modified Delphi Process. Each of these methodologies is supported by a host of software applications. The software applications usually require a computer work station for each of the “voting members” in the session.

As in the “harvesting ideas” step, a formally facilitated, small workshop session is well suited for a decision support session. Again, selecting appropriate workshop participants is critical to success. The members of the decision support session should typically be senior to the “harvesting ideas” participants. It is important that the members have some level of decision making authority in their parent organizations – this lends relevance and weight to the output of the session.

The analyst will be required to do an extensive amount of preparation for the decision analysis session. The output from the “harvesting ideas” sessions will require processing and packaging for the decision analysis session. These sessions are useful for sorting the inputs into broad groupings of importance (critical, essential, useful, not relevant). Caution must be exercised, however, because these decision analysis techniques may not have the analytical fidelity required to prioritize the outputs within a particular grouping. The workshop report must highlight this.

What are the advantages of employing decision analysis methods at this stage in the concept development process? The concept team now has a sense of what is important to senior staff members. This provides valuable guidance to the team. This insight will be valuable when developing the metrics required to assess the concept. More importantly, the decision analysis sessions may shorten the amount of time the draft concept spends in the staffing and review process. Engaging the key staff members responsible for reviewing the concept early in the development process serves to highlight the important issues that must be addressed by the concept development team.

5.4 “What-if” Analysis

At this stage in the process the concept development team has broadly examined the problem space and begun to develop a sense of what is important. How do the various components of the concept relate to each other? Seminar-style war gaming techniques can play an important role here. At this stage in the process, war gaming may be used to:

- Test assumptions, identify requirements.
- Explore questions of strategic guidance, human behaviour, and war fighting trends.
- Force participants to look at concept from different perspectives.
- Give concept developers and analysts new insights.

These sessions may be less formal than the “harvesting” and “decision analysis” sessions. The purpose of these sessions is to provide an opportunity for the concept development team to better understand the key aspects of the evolving concept. As such, broad participation by outside commands is not necessary and in some cases may not be advisable. Insights developed during the war gaming sessions must be documented in a formal report.

6.0 SUMMARY

In summary, this paper discussed the rationale for providing analysis support early in the concept development process. The outputs of the methodology outlined above include:

- A well-structured concept development project plan accompanied by a comprehensive analysis support plan.
- A clearer understanding of the issues the concept must address, including structured guidance from senior leadership on the most important aspects.
- A solid appreciation of the operational context that underlies the concept.
- A broadly-based set of alternative approaches to the concept.
- An explicit statement of the assumptions inherent in the concept.

All of these outputs will be formally documented in a series of reports in order to provide traceability and transparency. By adopting the operations research method and involving analysts early in the process, the concept development team will be better prepared to prepare the initial concept draft and will have developed a strong base for follow-on experimentation and concept refinement efforts.

7.0 REFERENCES

[1] Morse, Phillip M. and Kimball, George E (1951). *Methods of Operations Research*. MIT Press and John Wiley and Sons.

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Outline

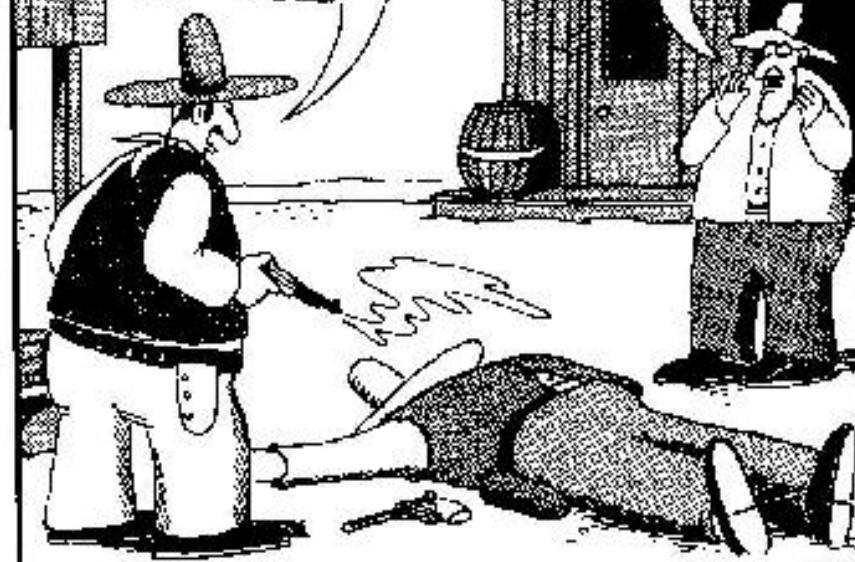
- **The need for analysis**
- **Research Support**
- **Develop analysis support plan, support development of concept development road map**
- **Analysis Support**
 - **Defining the question**
 - **Identifying what's important/developing alternatives**
- **Enforce Logical Debate**

slanom

HOTEL

OK, stranger...
What's the circumference
of the Earth?.. Who
wrote "The Odyssey"
and "The Iliad"?.. What's
the average rainfall of
the Amazon Basin?

Bart, you fool!
You can't shoot
first and ask
questions later!



Background

- **Analysis support to concept development frequently stated in terms of providing**
 - **Experimentation support**
 - **Modeling and simulation support**
- **Analysis support sometimes does not begin until after the concept development effort is well underway**

Analysis support is required early in the Concept Development process

The Need for Analysis

- Operations research is rooted in the scientific method
 - Scrupulously logical process
- Concept development effort may be driven by
 - Military Staff Planning process
 - Rhetorical methods
- Operations research practitioners are well suited to
 - Ensure logical flow of arguments
 - Provide analytical foundation for concept development process

Research Support

- **Several disciplines may be called upon to conduct basic research**
 - War Colleges, “Advanced Military Studies” typically support concept development
- **Operations analysts have much to offer in the basic research and data collection and analysis effort**
 - Good candidate to lead research team

Develop Analysis Support Plan

- One of the initial steps in the concept development process is to lay out a “road map”
 - Can be quite detailed
- 2 tasks for the analyst here
 - Help shape the overall “road map”
 - Develop “analysis support plan” in conjunction with the “road map”

Analysis Support Defining the Question

The problem of finding the problem

“It often occurs that the major contribution of the operations research worker is to decide what is the real problem”

Morse and Kimball, Methods of Operations Research, 1951

Defining the Question

- **First step in the scientific method: Define the objective**
- **Operations analyst should state this in the context of a structured scientific approach, and introduce concept development team to the follow-on steps of the analytic approach**
 - **Identify alternatives**
 - **Develop context**
 - **Examine assumptions**
 - **Develop metrics**

Consider Broad Range of Alternatives/ Identify What's Important

Decision support tools

- **Harvesting Ideas**
- **Sorting the inputs**
- **“What if” analysis**

Harvesting Ideas

- **Decision support tools helpful here**
- **Small workshop format**
 - **Need to recruit the right participants**
 - **Ensure broad range of commands and view points represented**
- **Collection software (GroupWare, Facilitate.com, SameTime, IWS)**
- **Process Modeling Software/Visualization Tools**
 - **Help participants better understand problem**
- **Analyst provides formal written report for each workshop**

Sorting the Inputs – Weighting and Prioritization

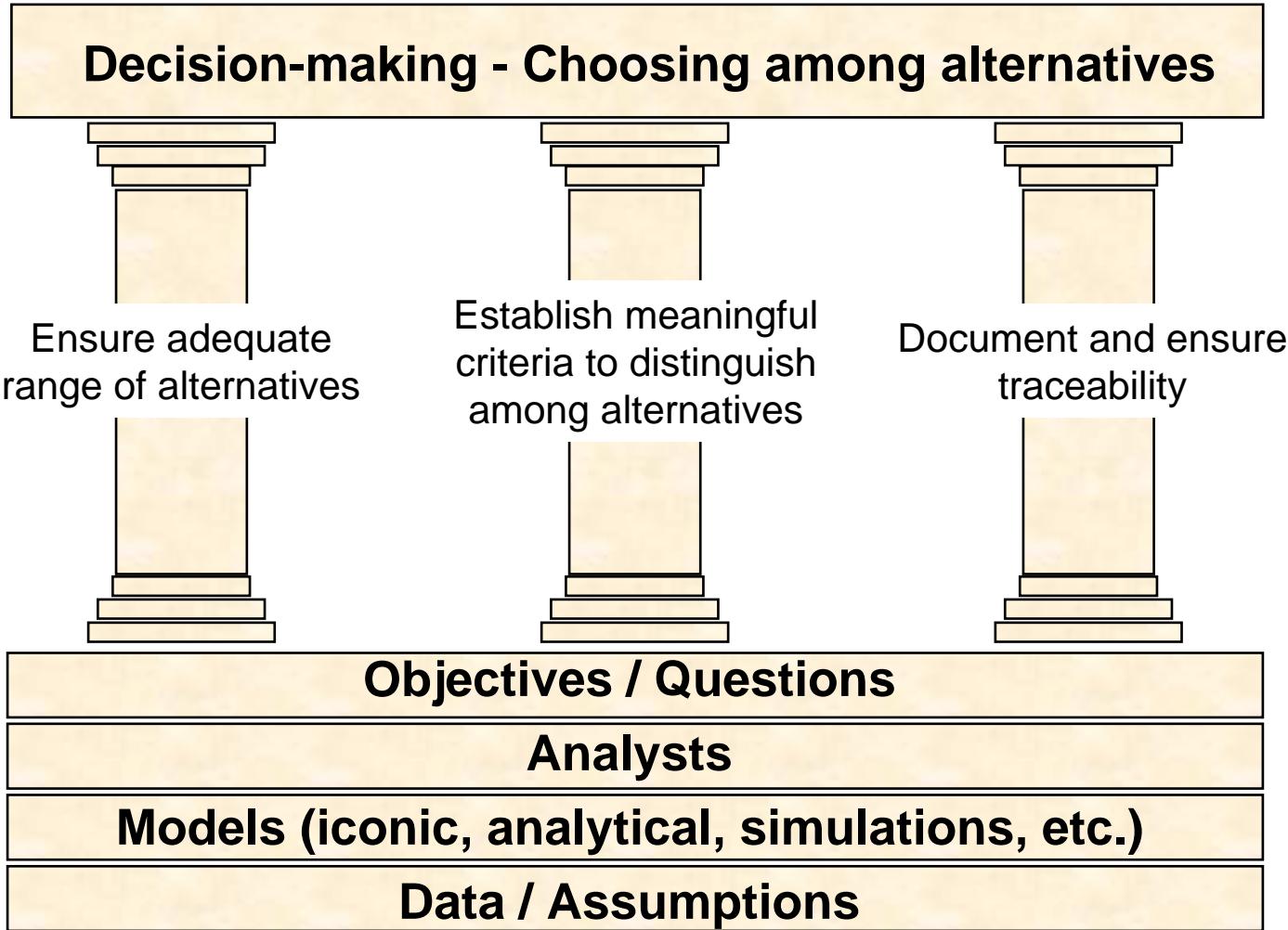
- **Analytic Hierarchy Process (AHP) methodology provides rigorous, credible tool**
 - Commercial software packages available (Team Expert Choice)
- **Formal, structured sessions**
- **Again, recruiting participants key to success**
 - This group should generally be senior to the “harvesting ideas” group
- **Analyst provides formal report**

What-If Analysis

Seminar War Gaming

- **Informal, seminar-style war games to examine alternative courses of action**
- **Process models and “white board sessions” help players visualize issues**
- **“Exploratory experimentation” may provide some insight into “what is possible” before more formal experimental program kicks off**
- **Formal report of results/insights**

Structured Decision-Making



Structured decision making involves many components.

Outputs From Decision Support

- 1. Clear understanding of fundamental problem**
- 2. Informed range of alternative approaches**
- 3. Better appreciation for “operational context”**
- 4. Examination of implicit and explicit assumptions**
- 5. Prioritized list of “what’s important” from senior staff members**
 - Serves as basis for developing metrics**

All of the above are documented in a formal analytic report

Enforce Logical Debate

- The analysis team can help ensure that early concept development products are logically consistent
- Common logical fallacies encountered in the concept development process
 - Taking as a premise something that should more properly be demonstrated as a conclusion (Hysteron Proteron)
 - Subtle variations on the Ad Hominem Attack
 - Slippery slopes, straw men, red herrings

Final Thoughts

“If you are developing concepts without a solid analytical foundation, you are simply making stuff up”

Bob Gregg, 2002

Questions?

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